RESEARCH DEPARTMENT

U.H.F. TRANSMITTING AERIAL FOR THE DIVIS TELEVISION STATION

Technological Report No. RA-3/8
UDC 621.396.712 1967/33

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for Head of Research Department

This Report uses SI units in accordance with B.S. document PD 5686.

June 1967.

U.H.

INTRODUC

A
(455 ft) m
column of
full servic

SUMMARY

Site:

Support St

General A

Channels:

Aerial:

Feeders:

Power:

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U.H.F. TRANSMITTING AERIAL FOR THE DIVIS TELEVISION STATION

INTRODUCTION

A u.h.f. transmitting aerial for the Belfast area has been built as a topmast on the existing 139 m (455 ft) mast at Divis. Space for this aerial was provided by rebuilding the Band I aerial on the support column of the mast[1]. The station started test transmissions from the aerial on 25th February 1967 and started full service on 18th March 1967.

SUMMARY OF INSTALLATION

Site: The site is Divis Hill, 6·4 km (4 miles) west of Belfast, national grid reference NW/413307, (Irish grid reference IJ287750) height 368 m (1206 ft) a.o.d.

Support Structure: The support structure consists of a 134 m (439 ft) stayed mast with a cantilever extension to 139 m (455 ft). The mast is of square cross-section with a side of 1·22 m (4 ft). Stays are fitted on bearings of 26°, 116°, 206° and 296° ETN.

General Arrangement: See Fig. 1.

Channels: The aerial is designed to operate on four channels simultaneously. The BBC channels are 21 and 27, of which the latter is used for the opening service (BBC-2). The ITA channels are 24 and 31. Channel 21 has positive offset, Channel 27 zero offset and Channels 24 and 31 have negative offset.

Aerial: The aerial comprises four tiers, each of four 4λ panels fed with nominally equal amplitude currents in phase rotation, giving a total radiating length which varies from 14·5λ at Channel 21 to 17·0λ at Channel 31. In each panel the power is divided unequally between the halves in order to fill the first minimum of the panel vertical radiation pattern. The panels are offset from the centres of the sides of a 889 mm (35 in.) square and are supported within a load-bearing glass-fibre cylinder of 1·52 m (5 ft) diameter. Figs. 2 and 3 show the arrangement of the panels inside the glass-fibre cylinder and Fig. 4 shows the construction of each panel.

The mean height of the aerial is 144·5 m (474 ft) a.g.l.

Feeders: The arrangement of the distribution feeders is shown schematically in Fig. 5.. Each half of the aerial is connected to the transmitters by a feeder type Hackethal HF-6.1/8 - 50.

Power: Two 25 kW vision transmitters and two 5 kW sound transmitters will be provided for each channel; at present only those for Channel 27 (BBC-2) have been installed. Each transmitter will be run at the maximum power allowed by the rating of the HF 7/8 - 50 distribution feeder. This will result in a maximum effective radiated power (e.r.p.) slightly less than the 500 kW permitted under the Stockholm Agreement.

Each vision transmitter is combined with a sound transmitter and the combined outputs are paralleled by means of a diplexer followed by a splitter transformer in order to eliminate differences between the modulation characteristics of the vision transmitters. A four-channel combining unit will be added later, as required.

Templet and Horizontal radiation pattern (h.r.p.):

The h.r.p. was required to be omnidirectional with a maximum e.r.p. not exceeding 500 kW. The specified tolerance on the h.r.p. uniformity was ±2·5 dB. The h.r.p.s at the vision carrier frequencies of each operating channel, which are shown in Figs. 6-9, are the mean of measurements on each half of the aerial.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be gapfilled with the maximum of radiation tilted 1·0° ± 0·1° below the horizontal.

The v.r.p.s obtained for each face, shown in Figs. 10-13, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:

Channel	21		24		27		31	
	dB		dB		dB		dB	
Mean intrinsic gain	12·4		12·6		12·8		13·1	
Deduct aerial losses	dB		dB		dB		dB	
Gapfilling	1·6		1·7		1·7		2·0	
Distribution feeder								
11 m (36 ft) HF 7/8-50	0·3		0·3		0·3		0·3	
Distribution transformers	0·1	2·0	0·1	2·1	0·1	2·1	0·1	2·4
Mean net gain	10·4		10·5		10·7		10·7	
Deduct other losses:								
Main feeder, 164 m (539 ft)								
HF - 6.1/8 - 50	0·9		0·9		0·9		1·0	
Feeder ground run	0·2		0·2		0·2		0·2	
Diplexer and splitter transformer	0·1	1·2	0·1	1·2	0·1	1·2	0·1	1·3
Mean effective gain	9·2		9·3		9·5		9·4	
H.R.P. maximum/mean ratio	1·4		1·6		2·2		2·5	
Maximum effective gain	10·6		10·9		11·7		11·9	

Programme Feed:

G.P.O. link

ACKNOWLEDGMENTS

The mechanical and electrical design, construction and setting-to-work of the aerial were carried out by The Marconi Company. The contracting authority was the BBC Transmitter Planning and Installation Department.

REFERENCES

1. New Band I Transmitting Aerial for the Divis Television Station. Research Department Report No. E-117/2, Serial No. 1966/10.

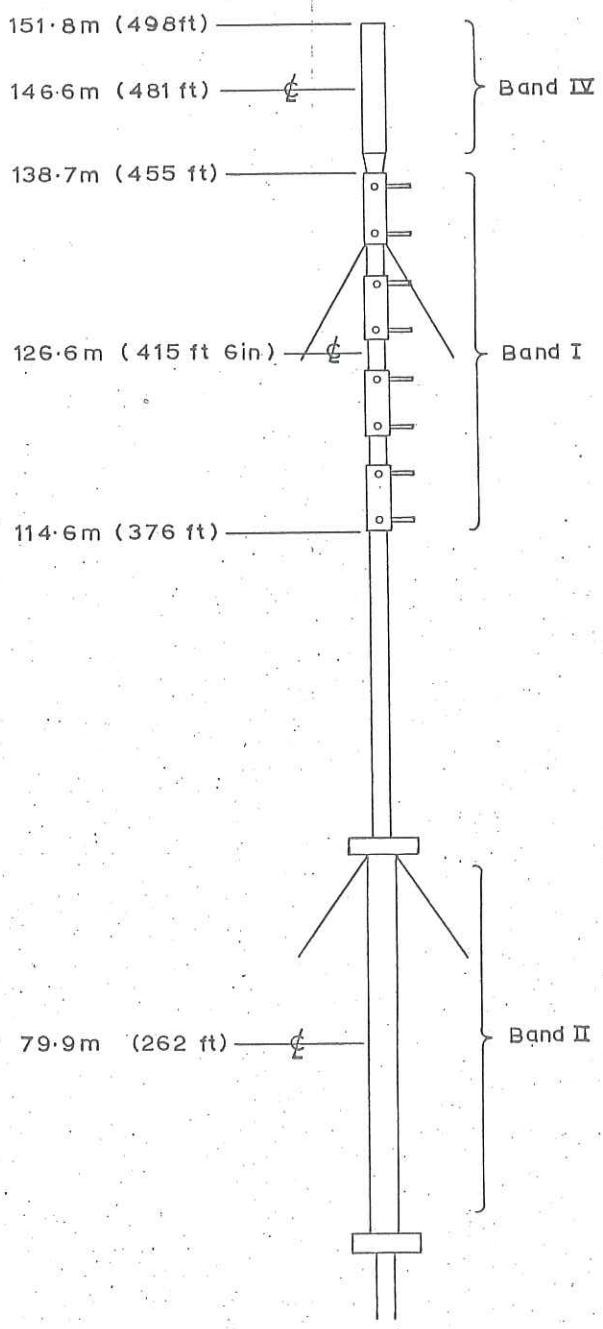


Fig. 1. General arrangement of aerials on mast.

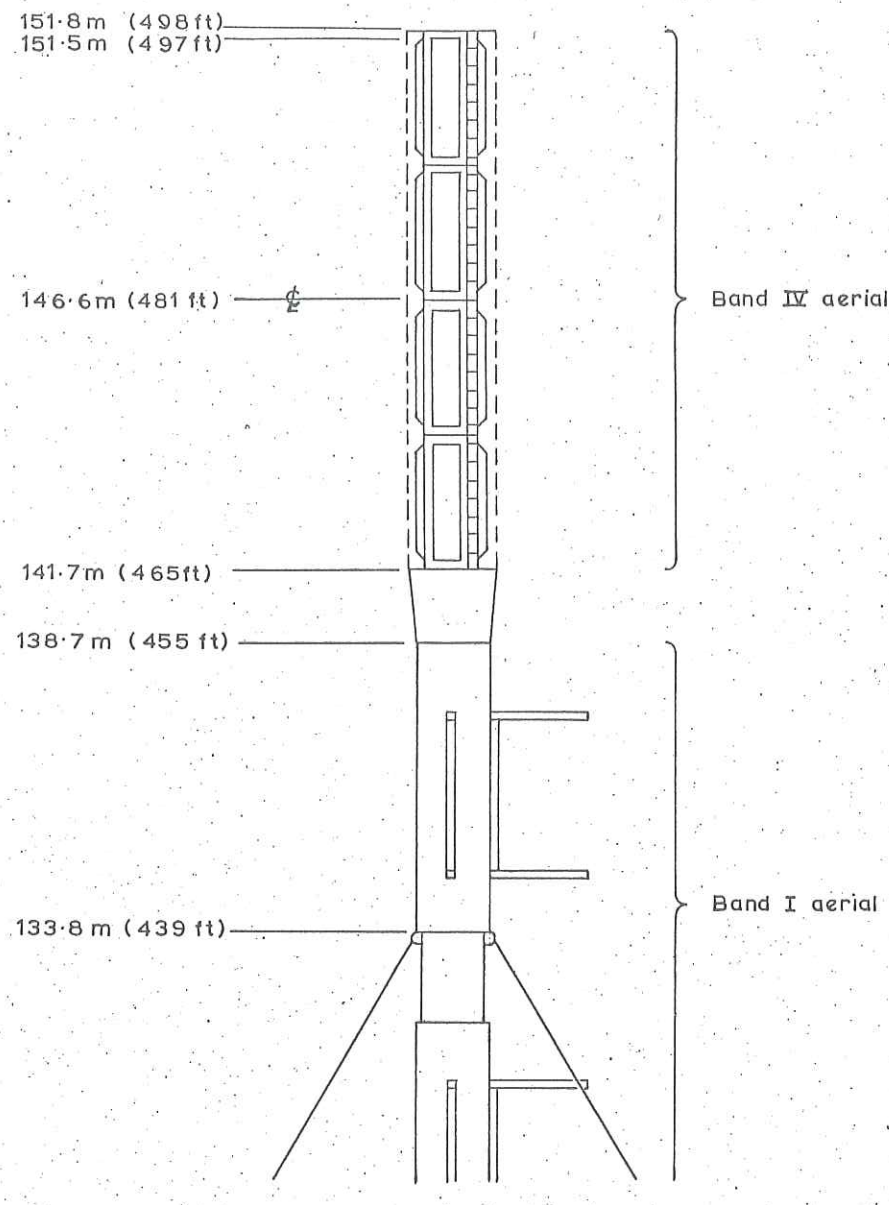


Fig. 2. Elevation of aerial.

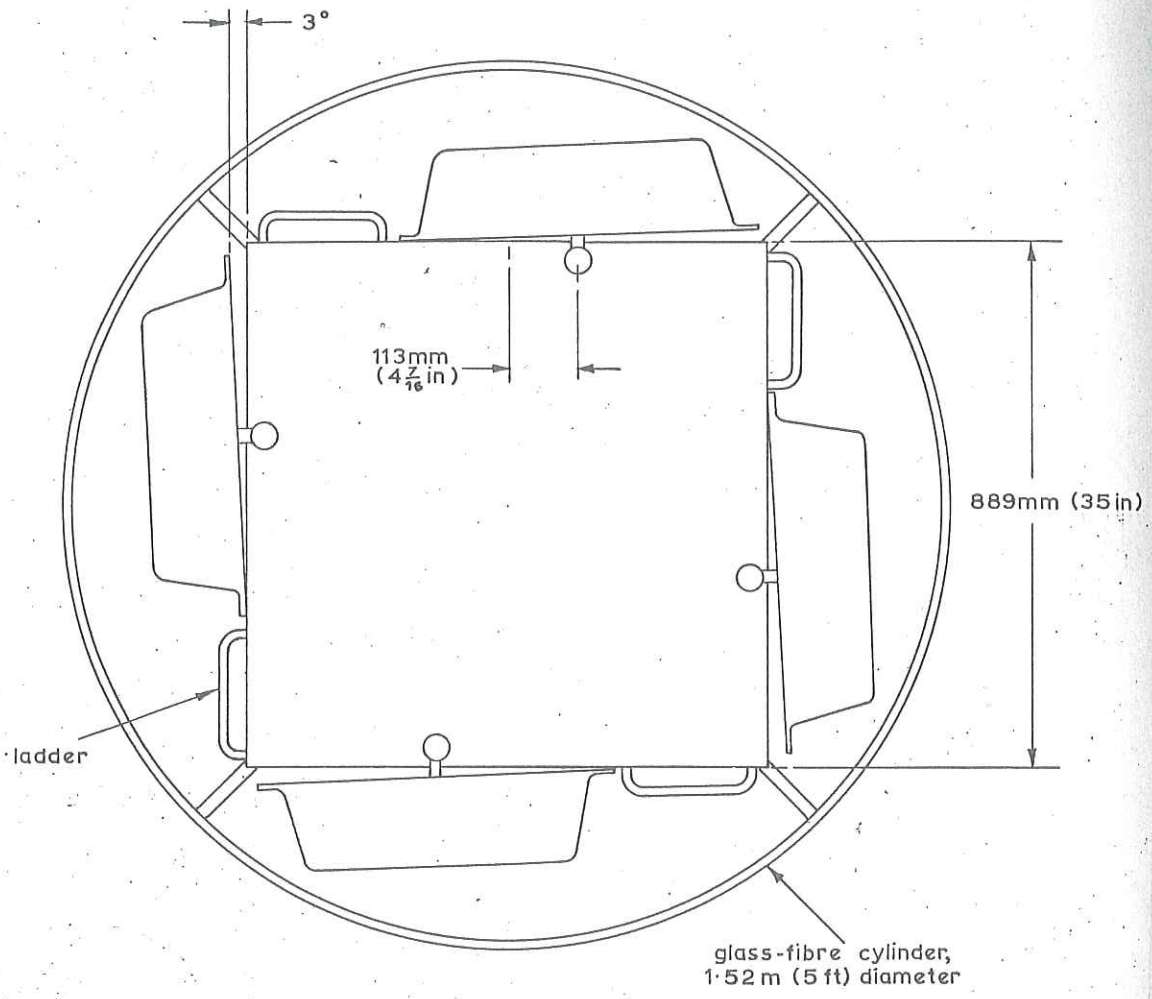


Fig. 3. Plan of aerial

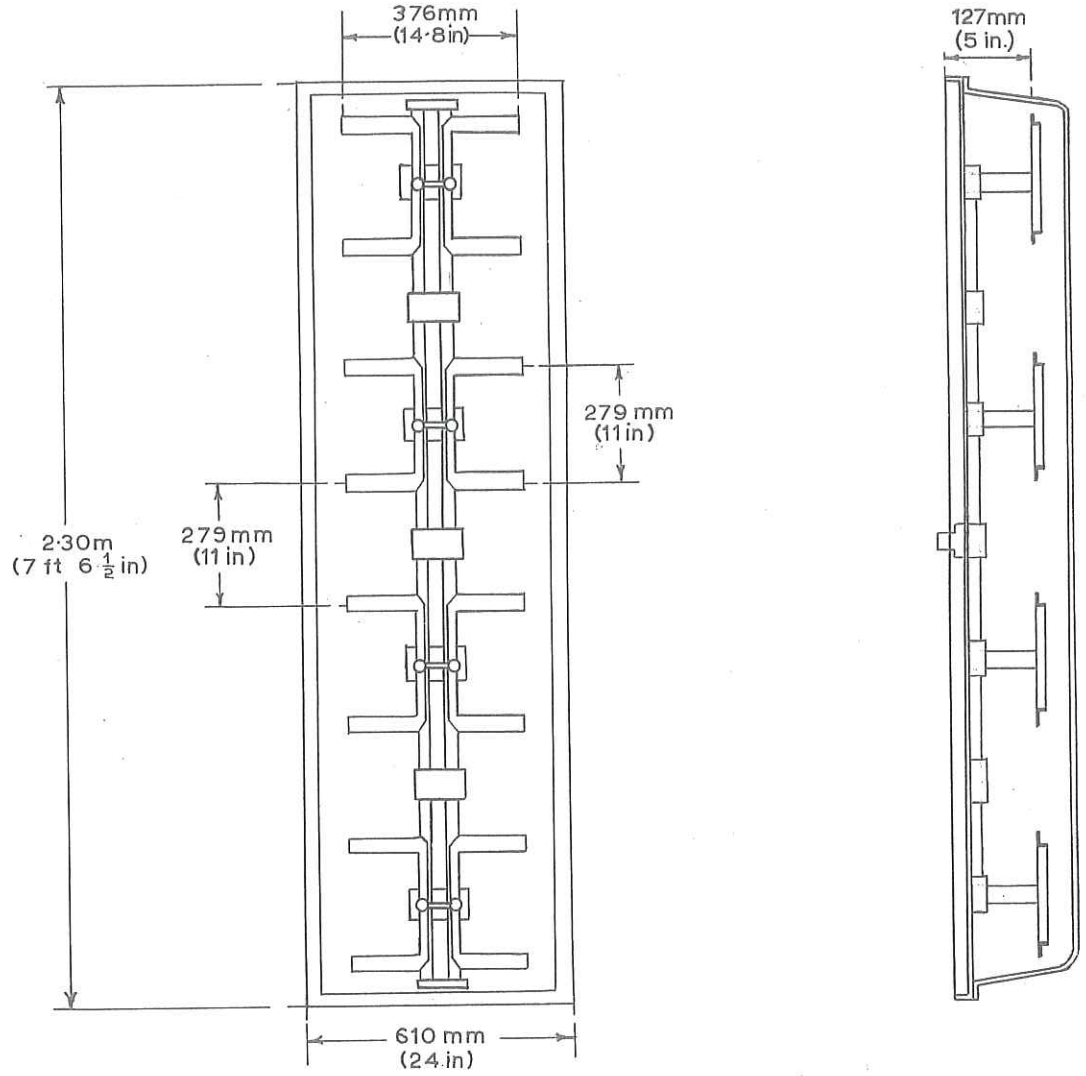


Fig. 4. Construction of single panel.

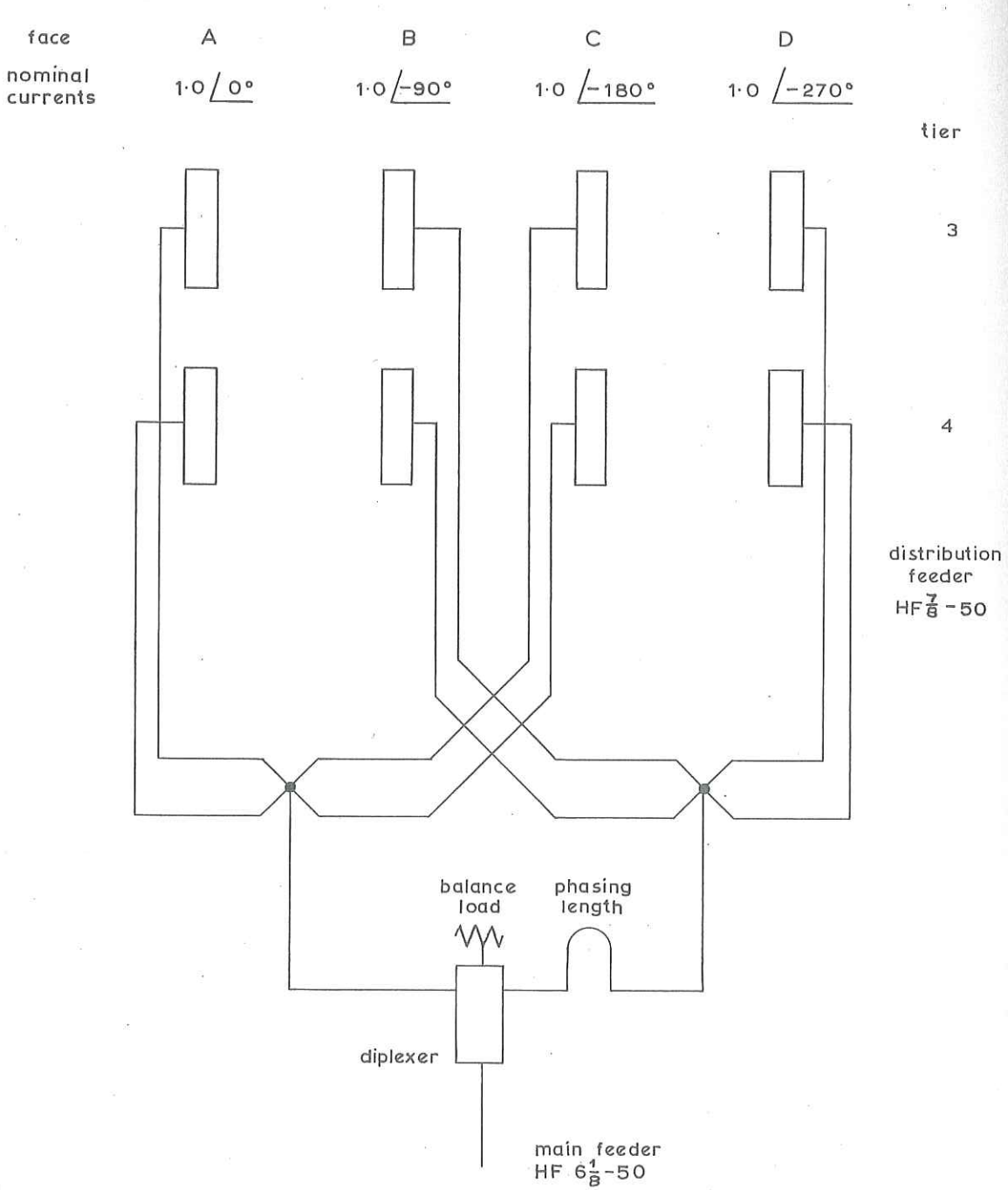


Fig. 5. Schematic of distribution feeder arrangement (lower half aerial).

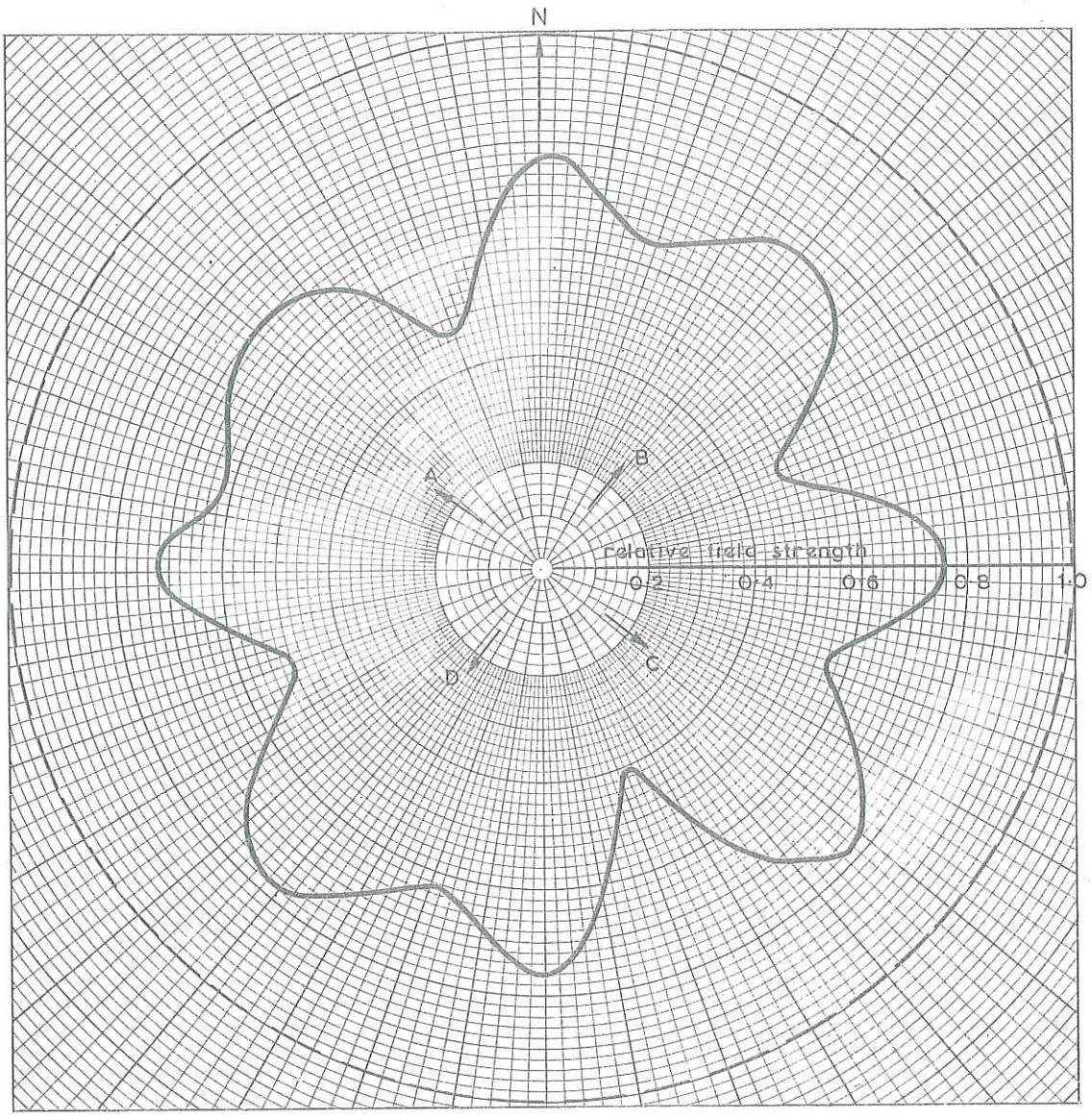


Fig. 6. Horizontal radiation pattern : Channel 21

HORIZONTAL POLARIZATION

Vision carrier 471·25 MHz, Sound carrier 477·25 MHz

Mean effective gain : 9·2 dB

Peak vision transmitter power : 2 x 13 kW

Mean E.R.P. 215 kW

—— —— Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 500 kW

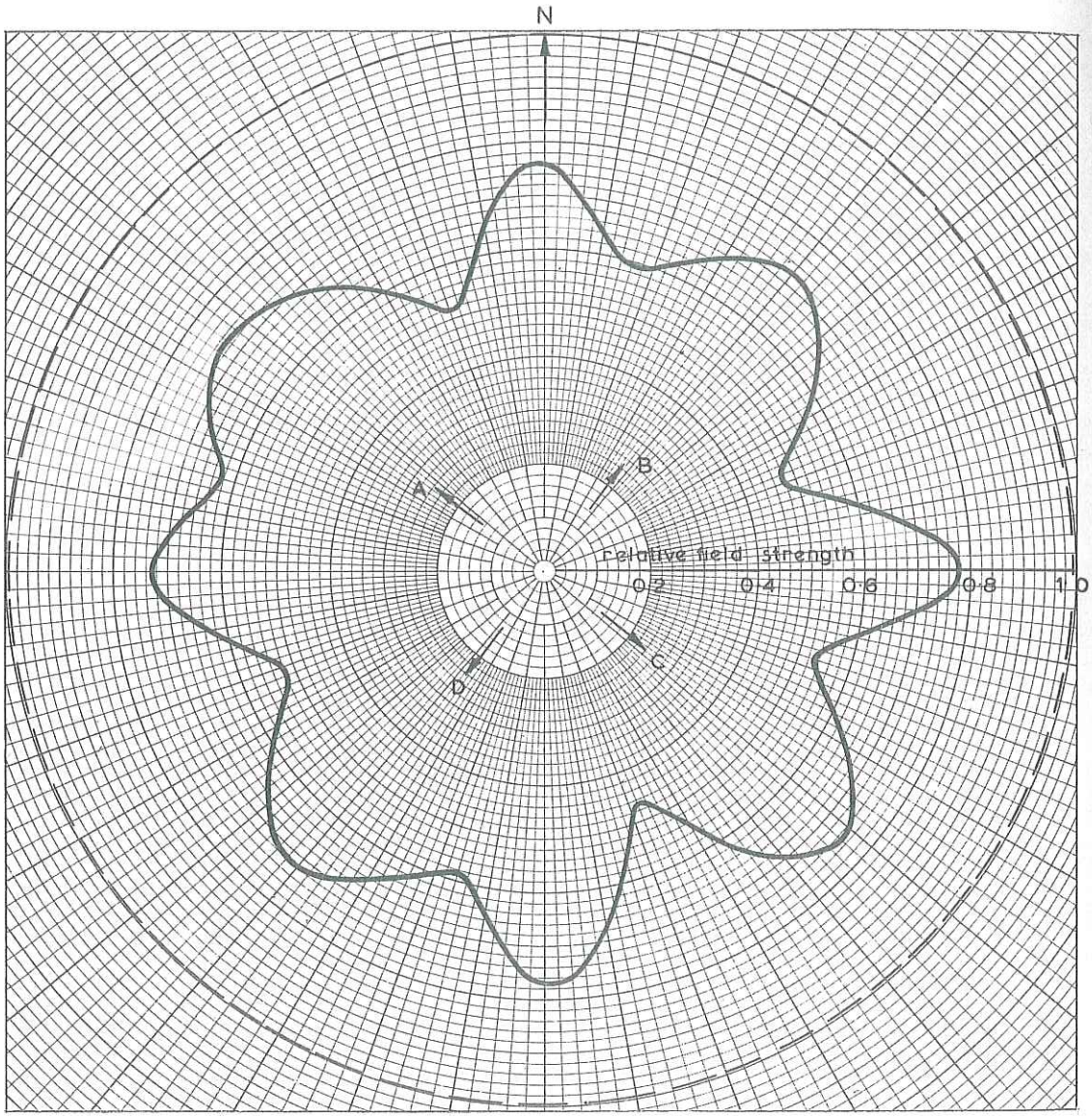


Fig. 7 Horizontal radiation pattern : Channel 24

HORIZONTAL POLARIZATION

Vision carrier 495·25 MHz, Sound carrier 501·25 MHz

Mean effective gain: 9·3 dB

Peak vision transmitter power: 2x12·5 kW

Mean E.R.P. 215 kW

—— —— Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 500 kW

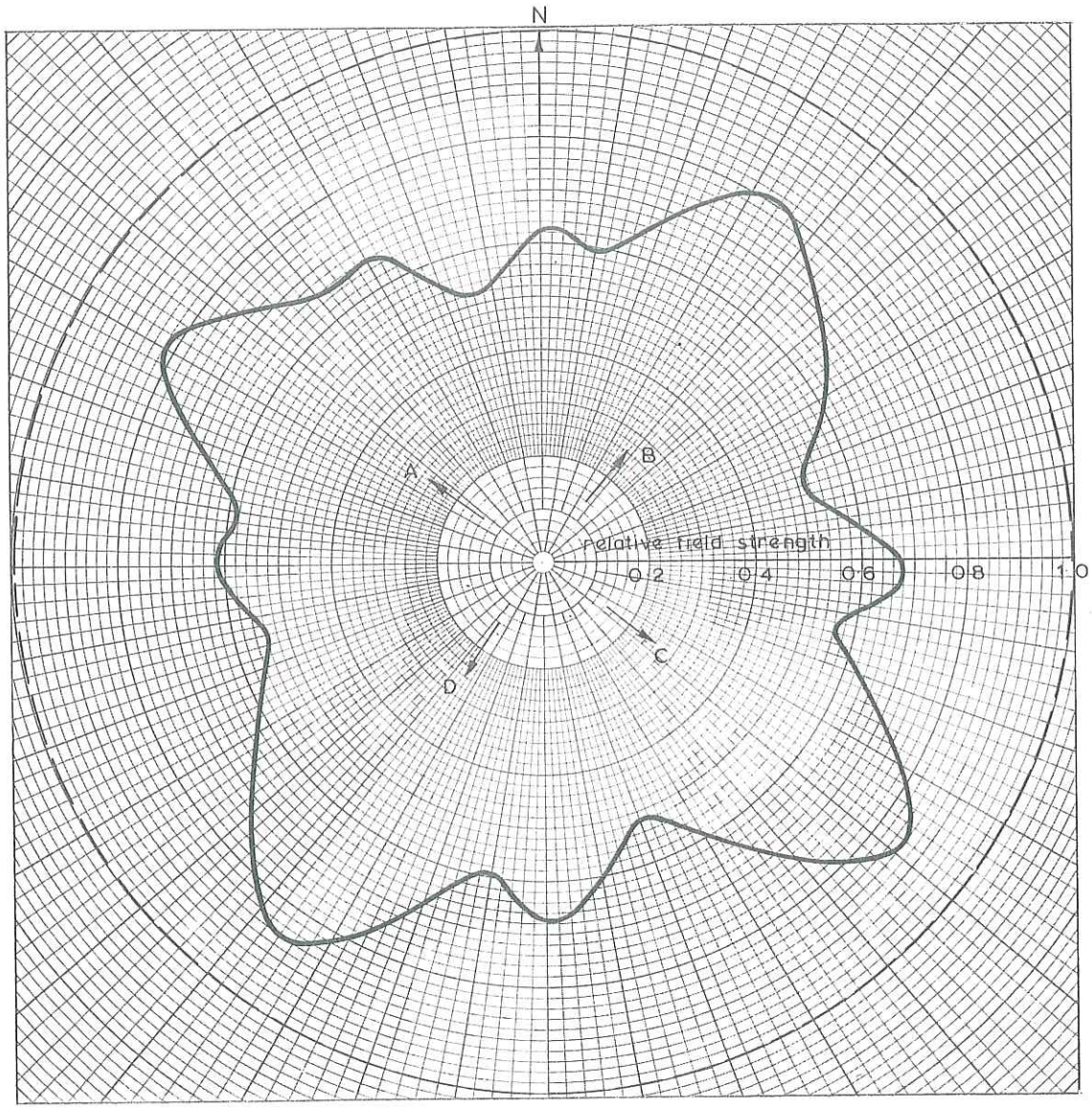


Fig. 8. Horizontal radiation pattern : Channel 27

HORIZONTAL POLARIZATION

Vision carrier 519·25 MHz, Sound carrier 525·25 MHz

Mean effective gain: 9·5 dB

Peak vision transmitter power : 2 x 12 kW

Mean E.R.P. : 220 kW

—— —— Stockholm E.R.P. limit.

Unit field corresponds to an E.R.P. of 500 kW.

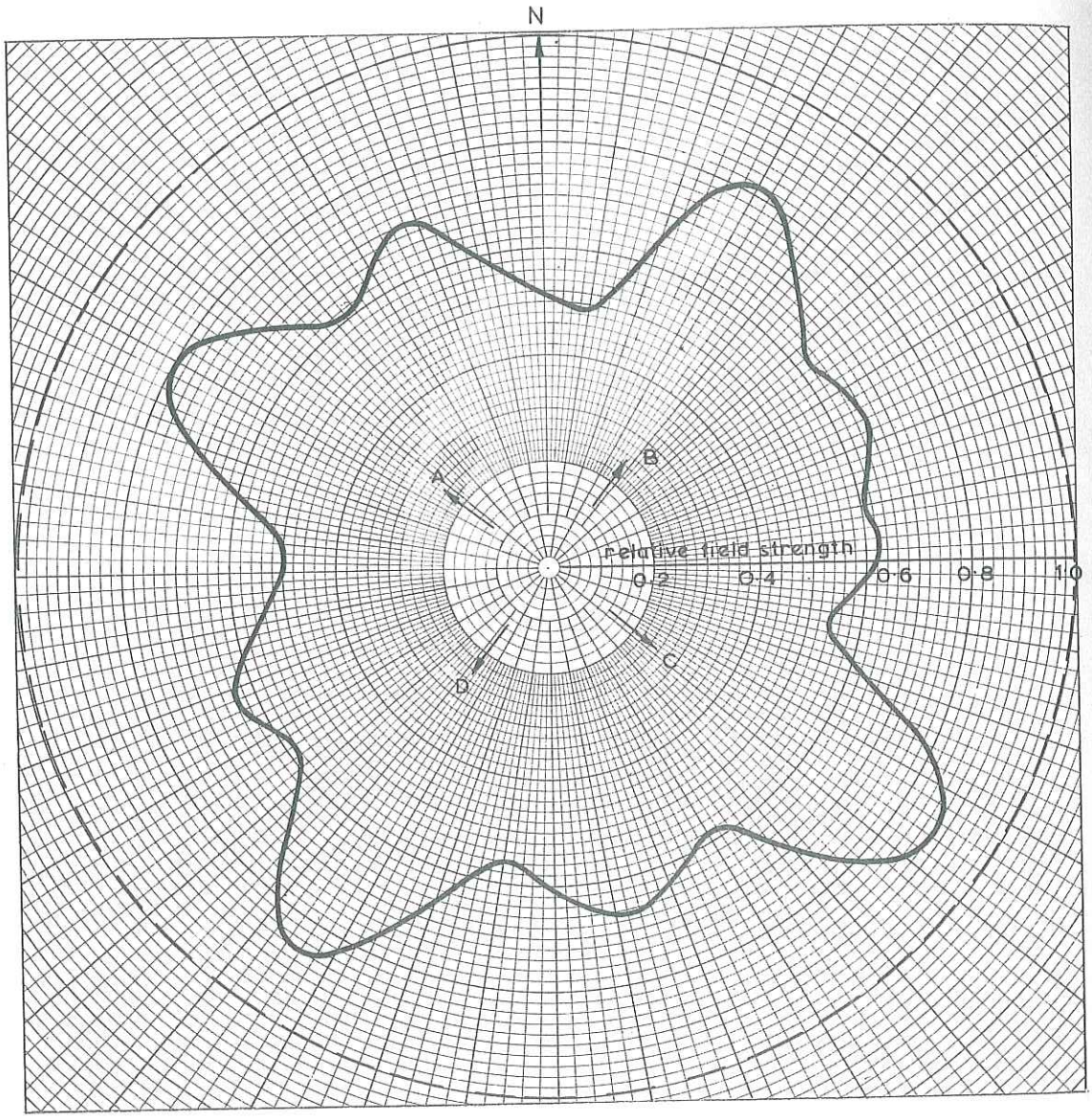


Fig. 9. Horizontal radiation pattern: Channel 31

HORIZONTAL POLARIZATION

Vision carrier 551·25 MHz, sound carrier 557·25 MHz

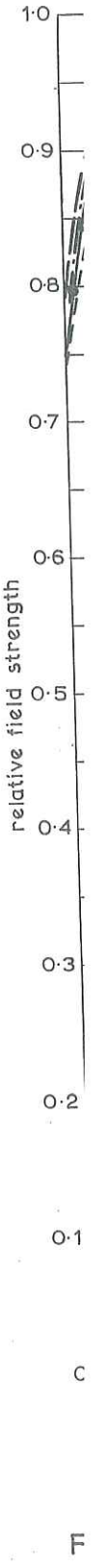
Mean effective gain: 9·4 dB

Peak vision transmitter power: 2×12·5kw

Mean E.R.P.: 220 kw

—— —— Stockholm E.R.P. limit.

Unit field corresponds to an E.R.P. of 500 kw



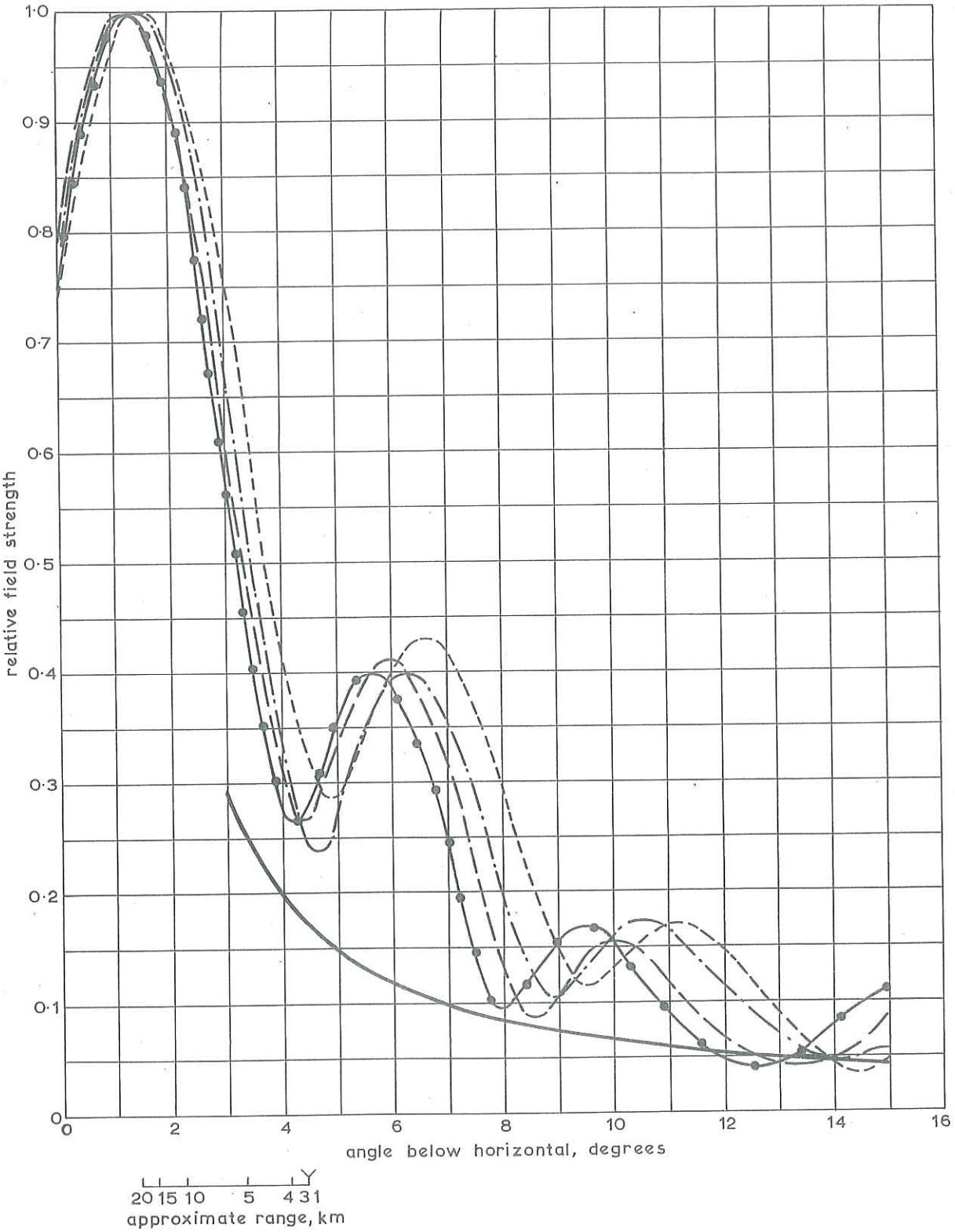


Fig. 10. Vertical radiation pattern on bearing 307° E.T.N. (face A)

---------- Channel 21 (BBC 1) —·—·— Channel 24
— — — — Channel 27 (BBC 2) —●—●—●— Channel 31
———— Specified minimum field

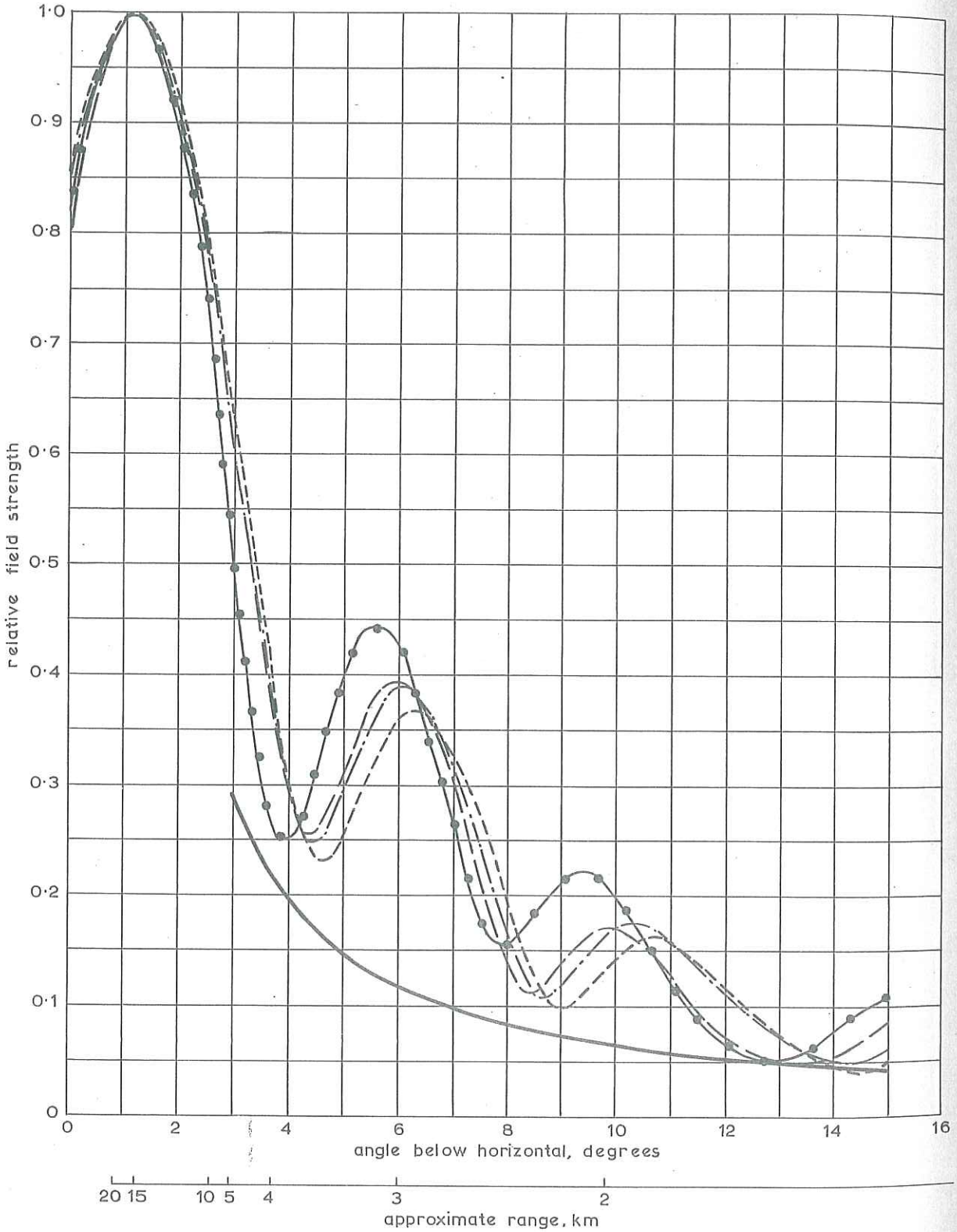


Fig. 11. Vertical radiation pattern on bearing 37° E.T.N. (face B)

– – – – – – – Channel 21 (BBC 1) —·—·— Channel 24

— — — — Channel 27 (BBC 2) —●—●—●— Channel 31

——— Specified minimum field.

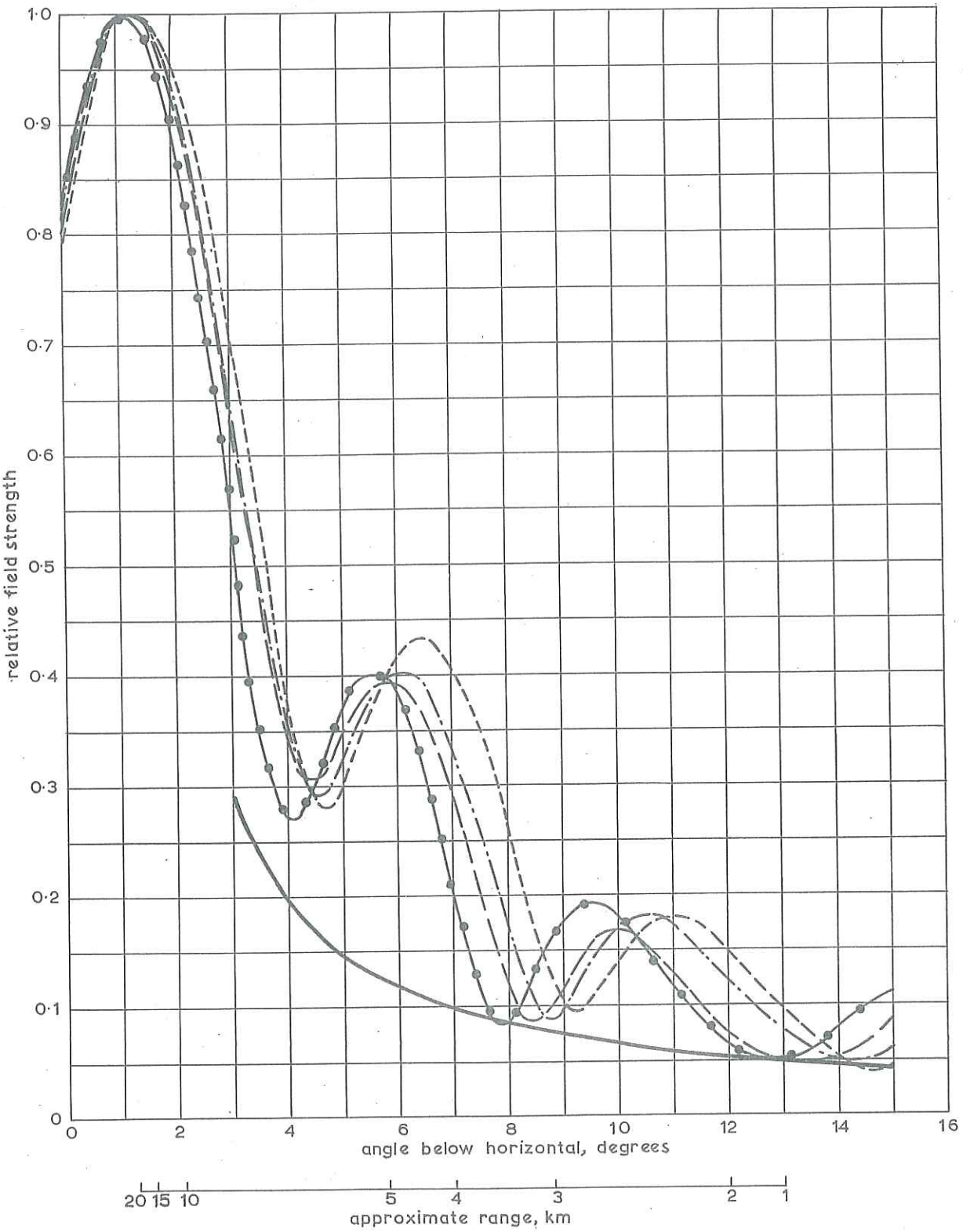


Fig. 12. Vertical radiation pattern on bearing 127° E.T.N. (face C)

– – – – – – – – Channel 21 —·—·— Channel 24

— — — — Channel 27 —●—●—●— Channel 31

———— Specified minimum field

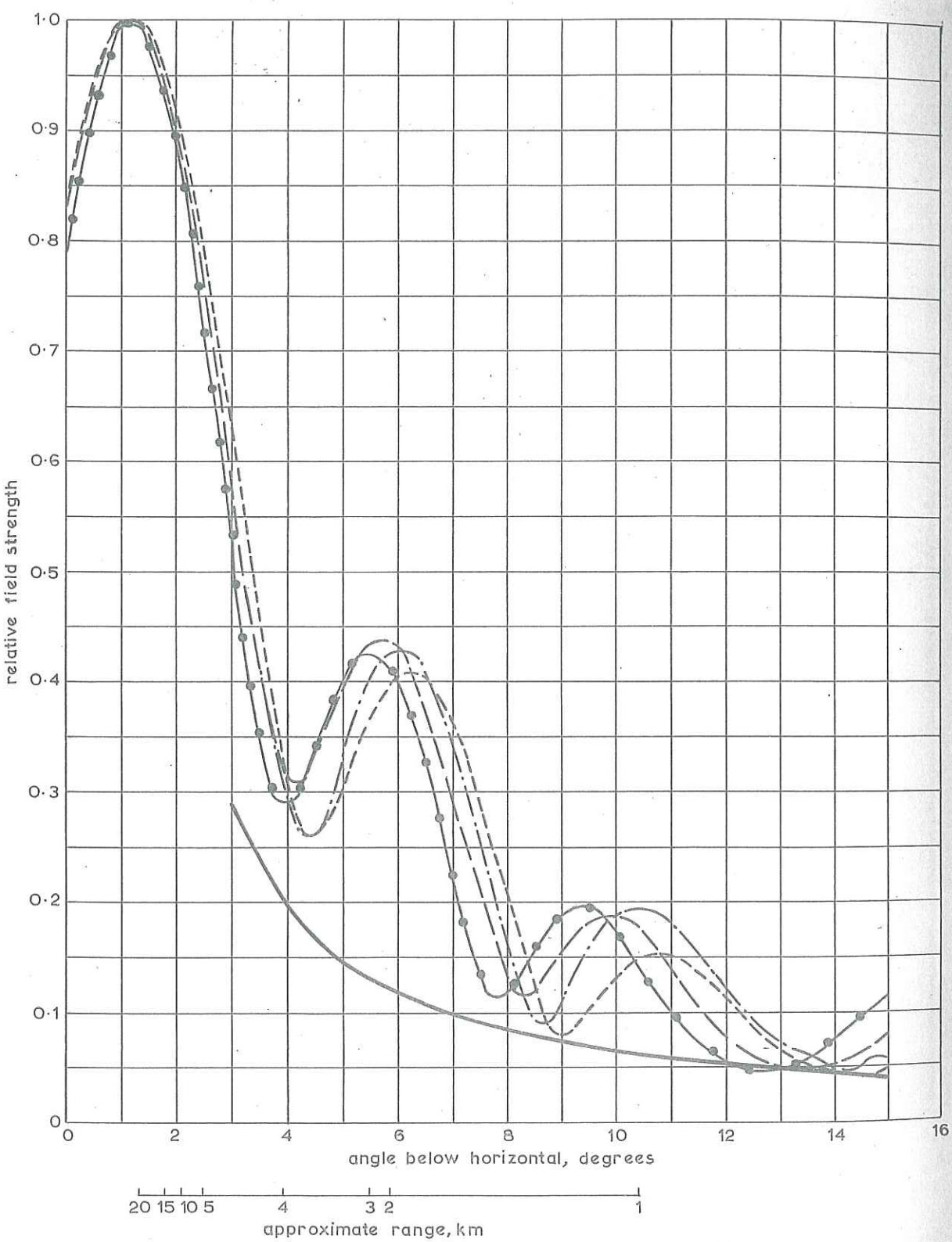


Fig. 13. Vertical radiation pattern on bearing 217° E.T.N. (face D)

Channel 21 — Channel 24
Channel 27 — Channel 31
Specified minimum field.

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